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THE ROLE OF FARM MANAGEMENT IN RELATION TO THE TECHNOLOGICAL DEVELOPMENT OF THE AGRICULTURAL INDUSTRY

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(1) It was observed by Polanyi in his book, The Great Transformation that, "at the heart of the Industrial Revolution in the 18th century there was an almost miraculous improvement in the tools of production, which was accompanied by a catastrophic dislocation of the lives of the common people." 1/ The technological revolution in Canadian agriculture of the 20th century, while perhaps not as dramatic in its dimensions as the industrial revolution, has had profound and far-reaching implications for the individual farmer and his rural community.

(2) More changes have occurred in Canadian agriculture during the past two decades than during the previous half-century. In some ways it appears that the rate of technological progress has occurred faster than the agricultural industry as a whole has been able to absorb. It has called for economic and social adjustments for which many farmers in Canada have not been adequately prepared. Technological advance has created a complex, highly capitalized business unit for which many farmers have neither the managerial skill or finances to cope. It has transferred most of the services previously produced on the farm to the rapidly growing agri-business sector of the economy, and in the process has exposed farmers to new problems of processing, marketing and bargaining power. Technological developments in agriculture have resulted in drastic changes in the farmer's rural institutions and his community, changes which he neither understands completely or accepts.

(3) There is no intention here to deplore the technological developments which have occurred in Canadian agriculture. A progressive nation depends on the abundance and efficiency of its food producing industry. Indeed, a large part of the economic development of the Canadian nation may be traced to the technological developments which have taken place in the agricultural sector of the economy. What we do intend to examine in this paper is the proposition that there is a growing gap between the technological possibilities of the agricultural industry and the corresponding economic adjustments needed at the individual farm level.

I

(4) Before we attempt to evaluate the impact of technological advances on the individual farm business, it is necessary to examine briefly the nature of these advances during the past quarter century. Gregor Mendel's pioneering work on the "Laws of Inheritance" were rediscovered in 1901. But it was not until the last two decades that the full force of the science of genetics was to be felt in the fields

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1/ Polanyi, K., The Great Transformation, p. 33, New York, (1944)

of plant and animal breeding. While the potential of the gasoline engine for agricultural uses was demonstrated during the 1920's, it was not until the last World War that tractors and self-propelled grain harvesters were widely used in Canada. Chemical control of weeds and insects was first attempted during the 1930's but it was not until the last decade that Canadian farmers really began to take full advantage of chemistry in their farming practices. Antibiotics and hormones have led to dramatic developments in the field of animal and poultry nutrition. Rural electrification has done more than any other innovation to reduce hand labor in farming and to permit an increasing degree of automation in the industry.

(5) There has been an implacable output of new discoveries from our agricultural research laboratories during the past quarter century, and the technological revolution is continuing. Even now plant scientists, through the process of chromosome substitution, are producing entirely new and higher yielding plants. The field of chemical genetics and the exciting new discoveries being made with respect to desoxyribosenucleic acid (DNA) in the nucleus of the living cell could generate still another scientific revolution in the field of agricultural production. The research work connected with the use of radioactive tracer techniques in plant and soils research, and in animal breeding and nutrition, promises new technological breakthroughs in agricultural production. New uses of chemistry in farming are still to be discovered. One can only guess what further advances will be made in terms of automating and mechanizing production processes in agriculture. We do know, for example, that mechanization has reduced the hand labor requirements in sugar beet production from 70 hours to 10 hours per acre, and in dairy production from 200 hours annually per cow to less than 75 hours over the last 20 years. We have seen the tractor and the self-propelled grain harvester replace a great number of horses and hired men from agriculture since 1940.

(6) It appears that technological innovations will continue to be injected into the Canadian agricultural industry regardless of the economic consequences for the individual farmer. This will be the inevitable result of the publicly sponsored type of agricultural research and extension services in Canada. It will be aided and abetted by the dominant philosophy that the goal of research and technological progress should be one of making two blades of grass grow where one grew before, or of making it possible for one man to do what two men did previously. 2/ There can be little doubt of the validity of such a philosophy. Unfortunately, however, we have not made the same progress in terms of dealing with the implications of technological progress for the individual farm business.

II

(7) Between 1941 and 1959 the farm labor force in Canada declined from 1.1 million to 692,000 persons. But underemployment is still a major problem in many parts of Canadian agriculture. During the same period of time the number of farms in Canada declined from 677,500 to less than 500,000 and still the "small farm problem" persists in many regions of the country. Many farms in Canada are badly undercapitalized even though capital investment for the industry as a whole increased from 4.2 billion to over 10 billion dollars over the past two decades. Farmers in Western Canada increased their fertilizer expenditures 3 times since 1941 and yet it is estimated that half the farmers have still not used fertilizer to date. Technological advances have called for a change in farming from a way of life to a business and still there are

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2/ Heady, E.O.,"Basic Economic and Welfare Aspects of Farm Technological Advance", Journal of Farm Economics, May (1949) Heady divides technological innovations as they apply to agriculture into two broad classes: the biological innovation which represents an output-increasing type of technology such as chemical weed sprays, hybrid cereals and insecticides; and the mechanical innovation which represents a labor saving type of technology such as tractors and rural electrification.

thousands of farmers in Canada who are presently classed as semi self-subsistence. A large number of Canadian farmers are still better qualified as workers than managers, even though the rewards are going increasingly to the well-managed farms. Technologically displaced farm people have been squeezed out of agriculture into other occupations for which they were ill-trained. Technological progress has reached out into the rural institutions with seriously disturbing effects. The school, the church, the village and the rural neighborhood have all been drastically changed within the last two decades.

(8) The above is not to suggest that Canadian agriculture is badly maladjusted or unresponsive to change. Changes and adjustments have taken place. Very substantial technological progress has been made. The point that is being made here is that the problems in Canadian agriculture are becoming less technological and more economic and social in nature. There is a large and growing gap between what is technologically possible and what is needed by way of economic adjustment if technology is to become the full blessing which it is intended to be.

(9) If the economic and social consequences of rapid technological progress in agriculture are disturbing for the advanced countries with a rapidly developing industrial economy, such progress could have serious and unpredictable results in countries whose economies are primarily agricultural, and whose culture and social traditions are even more opposed to rapid change. The advanced countries have a greater capacity to absorb the results of a rapid technological progress in agriculture. For example, technologically displaced persons from agriculture in the advanced industrial economies have the opportunity - albeit a limited one for many - to seek employment in non-farm industries. It is doubtful, however, if the same capacity for change exists at the present time in the economies of the less advanced countries of the world. 3/ As imperative as the need might be for an efficient agricultural industry in such countries, it would appear unwise to permit an indiscriminate or too rapid a development of technological innovations in the farming industry. One writer made the following comment with respect to less advanced economies. 4/

> "Any widespread use of mechanical power would present both economic and social problems. - - - - The point here emphasized for Mexico and many other similar countries is that improvement, which is much to be desired, does not necessitate supplanting crude tools with tractors. Mechanization may proceed in shorter steps from sickle to scythe, for example, a step which many Mexican farmers have not yet made."

III

(10) Before we examine the problems of adjustment and resource use at the individual farm level, we should recognize the institutional nature of the primary production unit in Canadian agriculture. The single proprietorship is the predominant type of firm in Canadian agriculture at the present time. Ownership and management control, as well as the labor required for the business, are generally identified with one person or family. This is the main prerequisite of the so-called family farm in Canada. It is the firm conviction of farm people in Canada that any forces or changes which separate the tri-part functions of owner-operator-manager from the farmer and his family result accordingly in a weakening of the family farm. 5/

3/ It should be noted, however, that even in a so-called advanced industrial economy such as Canada we have regions in the less developed sectors of the agricultural industry in which there exists chronic and persistent pvoerty. Culture, tradition, low education, fear of the unknown and ignorance of alternative opportunities make change in these areas extremely slow and difficult.

4/ De Graff, Harroll, "Some Problems Involved in Transferring Technology to Underdeveloped Areas", Journal of Farm Economics, November (1951)

5/ Gilson, J.C., Strengthening The Farm Firm, Agricultural Economics Bulletin No.6, Department of Agricultural Economics, University of Manitoba, April (1962)

Another unique feature of the family farm is the "biological cycle" through which it goes once every generation. It starts with the beginning farmer, adjusts and modifies with his growing family and eventually ends with his retirement. The farm is then passed on to the son who in turn goes through the same type of cycle during his lifetime on the farm.

(11) The economic structure of the family farm varies tremendously in Canada. The typical commercial farm in Western Canada, for example, may have a total capital investment ranging from $50,000 to $75,000, of which $5,000 to $15,000 will be borrowed capital. Total annual operating expenses for the farm business may range from $7,500 to $15,000. The farm may include from 320 to 640 acres of land under cultivation. However, variations will occur in both directions from the so-called "typical" commercial farm. It is not uncommon to find family farms in Western Canada with a capital investment of from $100,000 to $200,00. And at the other extreme, family farms in the less developed regions of the country may have a capital investment as low as $15,000 to $20,000, with the families on such units deriving a large part of their livelihood from home-grown consumption.

(12) Technological developments have had several important effects on the individual farm business. Perhaps, one of the most difficult problems facing the farm manager in Canada is that of finding the best "product-mix" or enterprise combination for his particular farm business. Continuous changes in prices, markets, technological developments and countless other forces which impinge on the farm business dictate corresponding changes in the production practices and enterprise combinations which will be most profitable for any given farm. Technological efficiency by itself is no guarantee of business success. Farm management studies have shown repeatedly that many farmers will be doing an excellent job with a given enterprise on their farms, but will be losing money because such an enterprise is not the right one for their particular farm unit. Farming in Canada is more than a production plant. It is a business. The primary criterion of success is the level of living which each operator derives from his farm.

(13) Another problem facing the Canadian farmer is the continuing need for an increase in scale or size of farm business to justify the adoption of many of the technological innovations which are available. Many farmers simply do not have a size of business large enough to justify the use of a particular production practice, regardless of how profitable it might be to the larger firm. To date the individualism of the Canadian farmer appears to have prevented the widespread practice of jointly sharing or owning costly machinery and equipment as an alternative to expanding the size of business. This is an area which would bear considerable investigation.

(14) Another important consideration at the individual farm level is the increasing tendency towards greater specialization. The increasing complexity of the farming operations, the economies of scale associated with a large volume of business, and the demand by the Canadian consumer for a uniform and high quality product have all placed a greater premium on specialization within the farm business. A great many farms in Canada are too highly diversified to achieve the economies and efficiencies associated with specialization.

(15) One of the more important results of the technological revolution in agriculture has been the increase in capital investment in the farm business. It is estimated that it requires control over a minimum of $30,000 in Manitoba to start farming, part of which will be borrowed capital. Studies have indicated that it is almost impossible for the young man to start farming without substantial help, usually from his parents. Even when the young man gets started in farming it will require at least $50,000 before he can be assured of an economic size of farm business; and this figure is steadily increasing.

(16) The ever increasing capital investment required to establish an economic size of farm business raises the question as to whether the individual farmer should attempt to pay for the business during his lifetime. Most farmers aspire to

a clear title to the business at the time of retirement. One wonders if this goal will be possible, or even reasonable, in the future. Perhaps, the share capital method of financing the farm business and "perpetual debt" will have to be considered.

(17) One of the more significant results of the growing size of business, borrowed capital, specialization and the increasing dependence on the market are the growing risks attached to the farm business. Farmers have traditionally built in their own forms of insurance and hedges against uncertainty through such actions as diversified farming and minimum debt. It appears that increasing emphasis will have to be placed on the more formal types of insurance programs in agriculture.

(18) Finally, and perhaps most significant of all, many farmers in Canada lack the managerial ability necessary to cope with the ever growing complexity of the farm business. No other industry in Canada requires as many managers as that of agriculture. The proprietary nature of the production firm in agriculture requires that every farmer must be a manager as well as a laborer. As important as the labor factor is in farming, it does not substitute for good management. Ways must be found to improve the management ability of many Canadian farmers if the industry is to remain progressive and responsive to continuing technological changes. This could be one of the most difficult problems we face in the years to come.

IV

(19) If the farm management specialist is to deal effectively with the many questions which are being raised by farmers and agricultural administrators in Canada, he will have to be supported by a continuing program of sound research. For some inexplicable reason it is believed by many (economists included) that solutions for the important economic problems associated with the farm business are readily available, or if not available, may be quickly obtained through farm accounts or farm management surveys. For those who have engaged in any serious research, nothing could be further from the truth. The farm management specialist must depend on a program of research every bit as tedious and complicated as that of the plant breeder or animal nutritionist. And like the fields of plant or animal science, farm management research may range from the Baconian methods of "getting the facts" to the highly deductive methods of mathematical economics. The philosophy of research is stressed at this point because not all administrators and fund granting bodies are entirely clear or sympathetic as to what is involved in the process of farm management research.

(20) It is not possible to elaborate in this paper on all phases of farm management research. Perhaps, however, it would be worthwhile to list some of the problem areas which appear to have considerable priority in any farm management research program in Canada at the present time: Extent and Nature of economies of scale associated with various aspects of the farm business; Nature of the risk and instability impinging on the farm business and alternative methods of coping with it; Processes of capital accumulation within the family farm; Investment of credit in the farm business and debt repayment capacity of various forms of investment; Various types of land tenure and implications for the farm business; Estate planning including such problems as father-son agreements, retirement plans, transfer of the farm between generations; Economic returns on various types of farm resources by geographic region and type of enterprise; Developing guidelines for the optimum combination of enterprises within the farm business; Problems associated with young farmers getting established in farming; Ways of adjusting to and accommodating various types of technological innovations within the farm business; Methods to facilitate the movement of the redundant labor resource from agriculture to other occupations.

(21) The above problem areas are only examples of what may be included in any farm management research program in Canada. The content of any research program will vary according to the training and inclination of the research worker and the environment in which he happens to be doing his work.

(22) It is the philosophy of this writer that a program of research in farm management should have a strong problem orientation. Accordingly, what will be

valuable in one country may not have any relevance or utility in another country. In working with graduate students from many of the underdeveloped countries of the world, we have observed at the University of Manitoba that there is a strong inclination for these students to develop their training along the lines of our more sophisticated research tools and techniques. They become quite conversant with such areas as linear programming and the use of the electronic computer. One wonders, however, how useful such training might be to many of these students when they engage in programs of farm management research in their own countries where electronic computers may not be readily available. This is a problem which is being closely examined in the U.S.A. at the present time.

V

(23) The extension techniques which have worked so effectively in the technical disciplines do not appear to be altogether suitable in the field of farm management extension work. In the technical disciplines the extension worker is primarily involved with the transfer from the research laboratory to the farm of single, isolated physical or biological practices. It is a "piecemeal" type of presentation of technical data to the farmer. In addition to this, the extension worker in the technical disciplines attempts to use the educational or demonstration approach involving large groups of farmers, rather than the personal service approach, in the presentation of his data. And in general, this approach has worked reasonably well.

(24) When it comes to the farm management extension worker, however, he is expected to go much beyond what is expected of the extension worker in the technical disciplines. The farm management extension worker is expected to move from the general meeting of farmers to the individual farm business. The farmer insists that if the various technical innovations are to be of any value to him they must be profitably incorporated into his particular farm business. The shift is from the piecemeal presentation of single, isolated practices to the whole farm; from the broadly educational to the personal service approach.

(25) This poses a problem for the farm management extension worker. If he is to reach the largest possible number of farmers he must attempt to deal with groups of farmers. If he is to deal in a meaningful way with many of the problems of the individual farmer, however, he must work with the individual farm business. We have found in our extension work in Manitoba that the extension worker must be very alert to the possibilities of dealing, whenever feasible, with groups of farmers, rather than the individual. For example, in farm accounting work, most farmers will attempt to have the extension worker deal with them individually. We have found, for the most part however, that the group technique can be very effective in accounting work. On the other hand, there are many problems of a personal business nature which are better handled on the individual farm basis.

(26) An example of the types of problems faced by the farm management extension worker in Western Canada may be illustrated by the requests for assistance which the writer has received from farmers during the past eight years: Help to set up and analyze farm accounts; Assistance with income tax returns; Establishing workable father-son operating agreements; Problems of estate planning such as life insurance, wills, farm transfers; Use of farm credit in the business; Rental arrangements; Setting up various types of contractual arrangements in production and marketing; Plans for security during retirement; Determination of the best combination of various types of enterprises on the farm; Wage incentive arrangements with the hired man; How to get started in farming; Debt carrying capacity of the farm business; Evaluation of the future prospects of various types of enterprises; Whether to continue farming or to move to some other occupation.

(27) The above are examples of some of the problems facing the farm management extension worker in Western Canada. It is interesting to note that while some of the problem areas may be handled on a group basis, most were of a personal service nature. In general it is clear from the problems raised by farmers that a continuing program of farm management research is imperative if meaningful answers are to be found.

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